We claim:

1. A microband electrode array sensor for detecting the presence or measuring the concentration of analytes in a sample, said sensor comprising:

a substrate having a first edge;

a plurality of microband electrodes between said substrate and a layer of insulating material, said layer of insulating material having a first edge;

said microband electrodes exposed at said first edges of said substrate and said insulating materials; and

said insulating material forming a plurality of gaps, one gap between each of two adjacent electrodes and each of said gaps having a length greater than the diffusion layer formed during operation of the sensor.

2. The sensor of claim 1 wherein each of said microband electrodes has a width less than about 25 micrometers and a thickness less than about 25 micrometers.

3. The sensor of claim 2 wherein said substrate is planar.

4. The sensor of claim 3 wherein each of said microband electrodes has a thickness of about 0.1 micrometers and a width of about 10 micrometers and said gaps are about 400 micrometers in length.

5. The sensor of claim 1 wherein said substrate is planar.

6. The sensor of claim 1 wherein said substrate is annular.

7. The sensor of claim 6 wherein said first edge is an inner edge and wherein said microband electrodes are exposed at said inner edge of said annular substrate.

8. The sensor of claim 1 wherein said first edge of said substrate and said first edge of said insulating material aligned to form a single edge and said microband electrodes exposed at said first edges of said substrate and said insulating materials.

9. The sensor of claim 1 wherein said microband electrodes are platinide metals.

10. The sensor of claim 9 wherein said microband electrodes are platinum.

11. The sensor of claim 9 wherein said microband electrodes are gold.

12. The sensor of claim 1 wherein said microband electrodes are carbon.

13. The sensor of claim 1 wherein said microband electrodes are mercury plated electrodes.

14. A multi-layer microband electrode sensor for detecting the presence or measuring the concentration of analytes in a sample, said sensor comprising:

a plurality of sensors of claim 1 separated from each other by insulating material.

15. The multi-layer microband electrode sensor of claim 14 wherein each of said substrates is planar.

16. The multi-layer microband electrode sensor of claim 14 wherein each of said substrates is annular.

17. The multi-layer microband electrode sensor of claim 14 wherein said insulating material is epoxy.

18. The multi-layer microband electrode sensor of claim 14 wherein said insulating material is deposited as a thin film.

19. A photolithographic method of making a microband electrode array sensor useful for detecting the presence and measuring the concentration of analytes in a sample, said method comprising the etch-back technique.

20. A photolithographic method of making a microband electrode array sensor useful for detecting the presence and measuring the concentration of analytes in a sample, said method comprising the lift-off technique.

21. A method of utilizing a microband electrode array sensor of the kind comprising a substrate having a first edge;

a layer of insulating material, on top of said substrate, said layer of insulating material having a first edge;

said first edge of said substrate and said first edge of said insulating material aligned to form a single edge;

a plurality of microband electrodes between said substrate and said layer of insulating material, said microband electrodes exposed at said single edge; and

a plurality of gaps, one gap between each of two adjacent microband electrodes and each of said gaps having a length great enough that no substantial overlap of diffusion layers occurs, said method comprising the steps of:

(a) contacting said sensor with a sample suspected of containing an analyte; and

(b) scanning the voltage from a negative voltage to a positive voltage such that the scanned voltage is of a range where said analyte should be oxidized or reduced at said microband electrode.

22. A method of utilizing a microband electrode array sensor of the kind comprising a substrate having a first edge;

a layer of insulating material on top of said substrate, said layer of insulating material having a first edge;

said first edge of said substrate and said first edge of said insulating material aligned to form a single edge;

a plurality of microband electrodes between said substrate and said layer of insulating material, said microband electrodes exposed at said single edge; and

a plurality of gaps, one gap between each of two adjacent microband electrodes and each of said gaps having a length great enough that no substantial overlap of diffusion layers occurs, said method comprising the step of:

(a) performing anodic stripping voltammetry.

23. A method of performing anodic stripping voltammetry to detect analytes in a sample, the method comprising the steps of:

(a) contacting the sample with the microband electrodes of the sensor of claim 1;

(b) applying a negative voltage for a sufficient time to allow for an analyte to be reudced onto the microband electrode; and

(c) scanning the voltage in a positive direction to oxidize the plated analyte off the microband electrode.

24. A method of performing cathodic stripping voltammetry to detect analytes in a sample, the method comprising the steps of:

(a) contacting the sample with the microband electrodes of the sensor of claim 1;

(b) applying a positive voltage for a sufficient time to allow for an analyte to be oxidized from the microband electrode; and

(c) scanning the voltage in a negative direction to reduce the plated analyte off the microband electrode.

25. A method of detecting the presence and measuring the concentration of analytes in a sample, the method comprising the steps of:

(a) contacting the sensor of claim 1 with a sample suspected of containing an analyte; and

(b) performing cyclic voltammetry.

26. A method of detecting the presence and measuring the concentration of analytes in a sample, the method comprising the steps of:

(a) contacting the sensor of claim 1 with a sample suspected of containing an analyte; and

(b) performing stripping voltammetry.

27. A microband electrode array sensor for detecting the presence and measuring the concentration of analytes in a sample, said sensor comprising:
a plurality of electrodes embedded between a substrate and an insulating layer, each of said electrodes having a tip exposed along the edge of said substrate and said insulating layer, and each adjacent tip having positioned therebetween a gap larger than the diffusion hemisphere of said analyte.

28. A microband electrode array sensor for detecting the presence and measuring the concentration of analytes in a sample, said sensor comprising:

a plurality of electrodes deposited on a substrate and covered with a layer of insulating material, each of said electrodes having a tip exposed along the edge of said substrate and said insulating material, and each adjacent tip having positioned therebetween a gap larger than the diffusion hemisphere of said analyte.

29. A method for detecting the presence of or measuring the concentration of at least one analyte in a sample, said method comprising the steps of:

(a) contacting a sample containing at least one analyte with the sensor of claim 1;

(b) applying an electrical potential to the sensor; and

(c) measuring the electrical current flowing through the sensor.

30. A method for detecting the presence of or measuring the concentration of a plurality of analytes in a sample, said method comprising the steps of:

(a) contacting a sample containing a plurality of analytes with the multi-layer sensor of claim 14;

(b) applying an electrical potential to the sensor; and

(c) measuring the electrical current flowing through the sensors.

31. A method for performing electrochemical measurements on a sample wherein the sensor of claim 1 is integrated into a channel.